Attorney Docket No.: 1017.P049US

RECEIVED
CENTRAL FAX CENTER
AUG 1 5 2006

09/982,688

IN THE CLAIMS:

1. (Previously Amended) A ultrasonic testing system operable to generate and sample sonic energy signal(s) in a manufactured object that results in an improved signal to noise ratio (SNR) within the sampled sonic energy signal(s), comprising:

a sonic energy signal generator having a set of operating characteristic(s), wherein the sonic energy signal generator is operable to generate sonic energy signals within the manufactured object, and wherein the ultrasonic testing system is operable to sample these sonic energy signals; and

a model processor, communicatively coupled to the sonic energy signal generator, wherein the model processor operable to determine a set of operating characteristic(s) that result in the improved SNR of the sampled sonic energy signals, and wherein the sonic energy signal generator is operable to generate the sonic energy signal(s) within the manufactured object based on the determined set of operating characteristic(s) that result in the improved SNR of the sampled sonic energy signals.

2. (Previously Amended) The ultrasonic testing system of Claim 1, the system further comprising:

a representation of the manufactured object accessible to the model processor; and

the model processor operable to determine a set of operating characteristic(s) that result in the improved SNR of the sampled sonic energy signals from the representation of the manufactured object.

3. (Previously Amended) The ultrasonic testing system of Claim 2 wherein the representation of the manufactured object is a CAD model.

4. (Previously Amended) The ultrasonic testing system of Claim 1, the system further comprising:

a sonic energy signal measuring device;

a signal analyzer communicatively coupled to the sonic energy signal measuring device;

the model processor communicatively coupled to the signal analyzer;

the sonic energy signal measuring device measuring the sonic energy signal(s);

the signal analyzer analyzing the measured sonic energy signal(s); and

the model processor deriving the operating characteristic for the sonic energy signal generator based on an output of the signal analyzer.

5. (Previously Amended) The ultrasonic testing system of Claim 4 wherein the sonic energy signal measuring device comprises an interferometer selected a group consisting of a confocal Fabry-Perot interferometer, a photorefractive two-wave mixing interferometer, a Michelson interferometer, a Mach-Zender interferometer, and a Sagnac interferometer.

6. (Previously Amended) The ultrasonic testing system of Claim 1, the system further comprising:

a programmable circuitry communicatively coupled to the model processor; and

the model processor deriving the operating characteristic using the programmable circuitry.

7. (Previously Amended) The ultrasonic testing system of Claim 1 wherein the set of operating characteristic(s) of the sonic energy signal generator are changed to match the determined set of operating characteristic(s) that result in the improved SNR of the sampled sonic energy signals.

8. (Previously Amended) The ultrasonic testing system of Claim 1, the system further comprising:

a control circuitry communicatively coupled to the sonic energy signal generator;

the control circuitry communicatively coupled to the model processor; and

the control circuitry operable to change the operating characteristic of the sonic energy signal generator based on an output of the model processor.

9. (Previously Amended) The ultrasonic testing system of Claim 1, the system further comprising:

the sonic energy signal generator having a property; and

the model processor deriving the operating characteristic from the property of the sonic energy signal generator.

10. (Previously Amended) The ultrasonic testing system of Claim 1 wherein the sonic energy signal generator is a laser generator.

11. (Previously Amended) The ultrasonic testing system of Claim 10 wherein the set of operational characteristic(s) associated with the sonic energy signal generator comprise at least one operational characteristic selected from a group consisting of optical wavelength, beam shape, beam size, pulse temporal profile, power, and time delay between successive pulses.

12. (Previously Amended) The ultrasonic testing system of Claim 10 wherein the laser generator is selected from a group consisting of a ruby laser, CO_2 laser, Nd:YAG laser, Yb:YAG laser, Nd:YVO_4 laser, Nd:YLF laser, Tm:YLF laser, Ho:YLF laser, Ho:YAG laser, alexandrite laser, excimer laser, and titanium sapphire laser.

13. (Previously Amended) The ultrasonic testing system of Claim 9 wherein the optical wavelength of the laser generator is obtained using a device selected from a group consisting of an optical parametric oscillator, an optical parametric amplifier, a Raman cell, a Brillouin cell, a difference frequency mixing setup, a sum frequency mixing setup, a harmonic generation setup, and a combination of an optical parametric oscillator and a difference frequency mixing setup.

14. (Previously Amended) The ultrasonic testing system of Claim 1 wherein the sonic energy signal is an ultrasonic signal.

15. (Previously Amended) An ultrasonic testing system operable to test physical attribute(s) within a manufactured object, comprising:

a sonic energy signal generator operable to produce a sonic energy signal within the manufactured object , the sonic energy signal having properties determined by a set of operating characteristic(s) associated with the sonic energy generator;

a sonic energy detector operable to detect the sonic energy signal; a signal analyzer communicatively coupled to the sonic energy detector operable to extract information representative of the physical attribute(s) within the manufactured object from the sonic energy signal; and

a model processor, communicatively coupled to the signal analyzer and to the sonic energy signal generator, wherein the model processor is operable to:

determine when a favorable signal to noise ratio (SNR) is associated with the sonic energy signal;

determine an optimized set of operating characteristic(s) associated with the sonic energy generator, wherein the sonic energy signal, when using the optimized set of operating characteristic(s), is operable to produce sonic energy signal(s) within the manufactured object having an improved signal to noise ratio (SNR) when a favorable SNR is not associated with the sonic energy signal.

16. (Previously Amended) The ultrasonic testing system of Claim 15 wherein the model processor selectively changes the set of operating characteristic(s) associated with the sonic energy generator .

17. (Previously Amended) The ultrasonic testing system of Claim 15 wherein the ultrasonic testing system is operable to initiate a retest of a portion of the manufactured object when a favorable signal to noise ratio (SNR) is not associated with the sonic energy signal, wherein the retest utilizes the optimized set of a set of operating characteristic(s) .

18. Canceled.

19. (Currently amended) The ultrasonic testing system of Claim ~~18~~ 15 wherein the ultrasonic testing system tests sections of a portion of the manufactured object in order until the entire portion has been tested.

20. (Previously Amended) The ultrasonic testing system of Claim 15 wherein information associated with the optimized set of operating characteristic(s) associated with the sonic energy generator a testing particular object is stored on a machine readable medium.

21. (Previously Amended) The ultrasonic testing system of Claim 15, the system further comprising:

a representation of the manufactured object communicatively coupled to the model processor; and

the model processor deriving the operating state from the representation of the manufactured object.

22. (Previously Amended) The ultrasonic testing system of Claim 21 wherein the representation of the manufactured object is a CAD model.

23. (Previously Amended) The ultrasonic testing system of Claim 15 wherein the model processor derives the optimized set of operating characteristic(s) associated with the sonic energy generator before the sonic energy signal generator generates the sonic energy signal.

24. (Previously Amended) The ultrasonic testing system of Claim 15, the system further comprising:

the model processor determines the optimized set of operating characteristic(s) associated with the sonic energy generator .

25. (Previously Amended) The ultrasonic testing system of Claim 15, the model processor comprising:

a programmable circuitry.

the model processor deriving the operating state using the programmable circuitry.

26. (Previously Amended) The ultrasonic testing system of Claim 15 wherein the sonic energy signal generator and sonic energy detector are found in a laser ultrasound system.

27. (Previously Amended) A method for generating an optimized sonic energy signal in a manufactured object that results in an improved signal to noise ratio (SNR) within sampled sonic energy signal(s), the method comprising:

deriving an optimized operating characteristic of a sonic energy signal generator;

adjusting the sonic energy signal generator to the optimized operating characteristic to produce the optimized sonic energy signal; and

operating the sonic energy signal generator to produce the optimized sonic energy signal.

28. (Previously Amended) A method for generating an improved sonic energy signal for use in testing a physical attribute of a manufactured object, the method comprising:

operating a sonic energy signal generator in a first state to produce a sonic energy signal about the manufactured object;

measuring the sonic energy signal with a sonic energy signal measuring device;

analyzing the result of the step of measuring;

determining when a favorable signal to noise ratio (SNR) is associated with the sonic energy signal;

deriving a second state of operation of the sonic energy signal generator based on the step of analyzing when a favorable SNR is not associated with the sonic energy signal , wherein the second state of operation is operable to produce sonic energy signal(s) within the manufactured object having an improved signal to noise ratio (SNR); and

selectively adjusting the sonic energy signal generator to operate in the second state to produce a second sonic energy signal.

29. (Original) The method of Claim 28 wherein the step of analyzing is performed with a signal analyzer.

30. (Original) The method of Claim 28 wherein the step of deriving is performed with a model processor.

31. (Original) The method of Claim 28 wherein the second sonic energy signal is an optimized sonic energy signal.

32. (Original) The method of Claim 28, wherein the step of deriving the second state uses a representation of the manufactured object.

33. (Original) The method of Claim 32 wherein the representation of the manufactured object is a CAD model of the manufactured object.

34. (Original) The method of Claim 28, the method further comprising:

the sonic energy signal generator having a property; and

the model processor deriving the second state of operation of the sonic energy signal generator from the property of the sonic energy signal generator.

35. (Original) The method of Claim 28 wherein the sonic energy signal generator is a laser.

36. (Original) The method of Claim 35 wherein the laser generator has at least one operational characteristic selected from a group consisting of optical wavelength, beam shape, beam size, pulse temporal profile, power, and time delay between successive pulses.

37. (Original) The method of Claim 35 wherein said laser generator is selected from a group consisting of a ruby laser, CO_2 laser, Nd:YAG laser, Yb:YAG laser, Nd:YVO_4 laser, Nd:YLF laser, Tm:YLF laser, Ho:YLF laser, Ho:YAG laser, alexandrite laser, excimer laser, and titanium sapphire laser.

38. (Original) The method of Claim 35 wherein the optical wavelength of the laser generator is obtained using a device selected from a group consisting of an optical parametric oscillator, an optical parametric amplifier, a Raman cell, a Brillouin cell, a difference frequency mixing setup, a sum frequency mixing setup, a harmonic generation setup, and a combination of an optical parametric oscillator and a difference frequency mixing setup.

39. (Original) The method of Claim 28 wherein the sonic energy signal is an ultrasound signal.

40. (Original) The method Claim 28 wherein the sonic energy signal measuring device comprises an interferometer selected from a group consisting of a confocal Fabry-Perot interferometer, a photorefractive two-wave mixing interferometer, a Michelson interferometer, a Mach-Zender interferometer, and a Sagnac interferometer.

41. (Previously Amended) A method for adaptively generating an improved sonic energy signal for use in testing a physical attribute of a manufactured object with a sonic signal generator and a sonic measuring device, the sonic signal generator operable in a first and a second state of operation, the sonic signal generator generating sonic signals about the manufactured object, the sonic measuring device measuring the sonic signals generated by the sonic signal generating device, the method comprising:

producing a first sonic energy signal with the sonic signal generating device operating in the first state of operation;

determining when a favorable signal to noise ratio (SNR) is associated with the sonic energy signal;

determining when a favorable signal to noise ratio (SNR) is not associated with the sonic energy signal , wherein a second state of operation is operable to produce sonic energy signal(s) within the manufactured object having an improved SNR;

selectively, based on the output of the step of determining :

deriving the second state of operation of the sonic generating device; and

producing a second sonic energy signal with the sonic signal generating device operating in the second state of operation.

42. (Original) The method of Claim 41 wherein the step of selectively producing the second sonic energy signal comprises:

deriving the second state of operation of the sonic signal generating device using a model processor;

the model processor communicatively coupled to the sonic signal generating device;

the model processor deriving the second state of operation of the sonic signal generating device from the output of a signal analyzer, the signal analyzer communicatively coupled to the sonic measuring device;

adjusting the sonic signal generating device to the second state of operation;

producing the second sonic energy signal using the sonic signal generating device; and

the sonic signal generating device producing the second sonic energy signal using the second state of operation.

43. (Original) The method of Claim 41 wherein the model processor derives the second state of operation of the sonic signal generating device from a representation of the manufactured object.

44. (Original) The method of Claim 43 wherein the representation of the manufactured object is a CAD model.

45. (Original) The method of Claim 41 wherein the model processor derives the second state of operation of the sonic signal generating device from a property of the sonic signal generating device.

46. (Original) The method of Claim 41 wherein the sonic signal generating device is a laser generator.

47. (Original) The method of Claim 46 wherein the laser generator has at least one operational characteristic selected from a group consisting of optical wavelength, beam shape, beam size, pulse temporal profile, power, and time delay between successive pulses.

48. (Original) The method of Claim 46 wherein said laser generator is selected from a group consisting of a ruby laser, CO_2 laser, Nd:YAG laser, Yb:YAG laser, Nd:YVO_4 laser, Nd:YLF laser, Tm:YLF laser, Ho:YLF laser, Ho:YAG laser, alexandrite laser, excimer laser, and titanium sapphire laser.

49. (Original) The method of Claim 46 wherein the optical wavelength of the laser generator is obtained using a device selected from a group consisting of an optical parametric oscillator, an optical parametric amplifier, a Raman cell, a Brillouin cell, a difference frequency mixing setup, a sum frequency mixing setup, a harmonic generation setup, and a combination of an optical parametric oscillator and a difference frequency mixing setup.

50. (Original) The method of Claim 41 wherein the sonic energy signal is an ultrasound signal.

51. (Original) The method Claim 41 wherein the sonic energy signal measuring device comprises an interferometer selected from a group consisting of a confocal Fabry-Perot interferometer, a photorefractive two-wave mixing interferometer, a Michelson interferometer, a Mach-Zender interferometer, and a Sagnac interferometer.

52. (Original) The method of Claim 41 wherein the testing of the physical attribute of the manufactured object is performed on a plurality of sections in an area of a manufactured object, the plurality of sections overlapping to form the area, the testing continuing until all of the sections have been tested.

53. (Original) The method of Claim 52, the method further comprising:
deriving a state of operation of the sonic signal generating device before testing each section.

54. (Previously Amended) A method for testing a physical characteristic in a portion of a manufactured object, the portion comprising sections, the method comprising:

testing a first section in the portion of the manufactured object, the step of testing comprising:

determining the initial operating state of a sonic energy signal generator, a model processor determining the initial operating state;

operating the sonic energy signal generator in the initial operating state, the sonic energy signal generator initiating a sonic energy signal about the manufactured object;

determining when a favorable signal to noise ratio (SNR) is not associated with the sonic energy signal , wherein a second state of operation is operable to produce sonic energy signal(s) within the manufactured object having an improved SNR; and

another

selectively operating in the other operating state based on the step of determining if another operating state is justified; and

testing each of the remaining sections according to the step of testing the first section, until the portion has been completely tested.

55. (Previously Amended) A system for adaptively generating an improved sonic energy signal on or in a manufactured object using a sonic energy signal generator and a sonic energy signal measuring device, the sonic energy signal measuring device communicatively coupled to the sonic energy signal generator, measuring a sonic energy signal associated with the manufactured object, and producing a measured signal, the system comprising:

a model processor communicatively coupled to the sonic energy signal generator, the model processor receiving the measured signal; and

the model processor determining a new operating characteristic of the sonic energy signal generator from the measured signal when a favorable signal to noise ratio (SNR) is not associated with the sonic energy signal.

56. (Previously Amended) A method for adaptively generating a sonic energy signal for use in testing a manufactured object, the sonic energy signal produced about the manufactured object with a sonic energy signal generator operating in a first or a second mode of operation, the method comprising:

determining when a favorable signal to noise ratio (SNR) is associated with the sonic energy signa operating in the first mode of operation, can be improved; and

selectively enabling the sonic energy signal generator to be operated in the second mode of operation, based on the step of determining, such that the sonic energy signal generator is operable in the second state of operation to generate another sonic signal about the manufactured object.